

## **REPORT ON MEASURES RELATING TO BOVINE SPONGIFORM ENCEPHALOPATHY (BSE) IN THE UNITED STATES**

The Secretary's Foreign Animal and Poultry Disease Advisory Committee's Subcommittee on the United States' Response to the Detection of a Case of Bovine Spongiform Encephalopathy (hereafter referred to as 'the subcommittee'), consisted of Prof. U. Kihm (Switzerland), Prof. W. Hueston (USA), Dr. D. Matthews (UK), Prof. S. C. MacDiarmid (New Zealand) and Dr. D. Heim (Switzerland). The subcommittee convened in Washington D.C. on 22-24 January 2004, and considered data provided on the epidemiological and associated investigations surrounding the index case of BSE in the USA. The subcommittee also considered the scope of policy options and measures being considered to address the newly recognized BSE situation that exists in the USA and within the broader North American context. The objectives of the visit, as described in the Charter issued by the USDA, included:

The subcommittee will be tasked to assess the scope, thoroughness, and appropriateness of the design and delivery of the epidemiological investigation conducted subsequent to December 22, 2003, of the detection of a BSE positive animal in the United States, its conformance with recommended international standards, and the extent to which lessons learned in other jurisdictions have been fully considered.

The review will provide an expert opinion as to the termination of the active investigation phase based on the information gathered and determination of any additional public or animal health benefits which might possibly remain outstanding or achievable.

The review will also consider the response actions taken to date by the United States and provide recommendations in the areas of Specified Risk Materials (SRM) removal, slaughter methods, surveillance design and approaches, feed restrictions, feed manufacturing and sales, traceability enhancements, and other areas which could provide meaningful additional public or animal health benefits in light of the North American experience.

The review will not expressly reconsider the measures implemented since 1985 to reduce the threat of BSE exposure or amplification within the United States. However, information derived through the United States' self assessment process and previous risk assessments carried out by the European Commission, New Zealand, Canada, and other countries are available for the subcommittee's review and consideration.

The subcommittee recognised that it is important to take into account the current state of knowledge, and that some of the unknown factors that had generated public health alarm in 1996 are now no longer so uncertain. Fear of the unknown is no longer sufficient justification for the establishment of national and international policy. In making its recommendations, the subcommittee used its knowledge of and experience in BSE, in conjunction with standards provided by the OIE. Furthermore, problems of translating science into effective controls in the face of economic and other pressures were also considered.

The team wishes to clearly acknowledge the openness, full disclosure and access to personnel provided by the US authorities to our team.

## **Scope, thoroughness and appropriateness of the design and delivery of the epidemiological investigation.**

The subcommittee reviewed data relating to the investigation of the index case of BSE in the USA. This included data from Canada as well as from investigations conducted in Washington state and elsewhere. The subcommittee concluded that:

### **Investigation**

- The epidemiological investigation into the origin of the BSE case conforms to international standards, insofar as it could be conducted in the face of the limitations of cattle identification systems in place in North America.
- The active investigation of BSE creates some communications challenges. The hold orders placed on the index herd (and other herds where imports were located) conveyed the impression that BSE is contagious. BSE is not a contagious disease and is not spread by direct contact among animals. The reasons for actions taken must be clearly explained so as not to create misimpressions or appear to validate actions that are not supported by the scientific knowledge of the disease.
- The limitations of the cattle identification system necessitated a more extensive tracing exercise than would otherwise have been necessary in order to identify cattle to be culled in accordance with international standards, thus enabling the identification of some animals only by process of elimination.
- Culling strategies are inevitably complex, especially because of the difficulty in identifying a “feed cohort”, namely animals exposed to the same batch of contaminated feed. This is common to the majority of BSE cases identified world-wide. Therefore, the identification of a “birth cohort” in accordance with OIE guidelines is appropriate, within the limitations imposed by cattle identification and tracing records.
- The approach adopted by the USA in targeting the offspring of the index case born within the two years prior to clinical onset is in agreement with OIE recommendations. The extrapolation of that requirement to include the slaughter of 448 other calves that were reared alongside the bull calf born to the index case in November 2003 cannot be justified on animal or public health grounds, but the decision to do so on practical and economic grounds is recognised.
- With regard to the timing of the culling of offspring of the index case and of cohort animals, it should be recognised that current OIE recommendations do not require the immediate culling of such animals provided they are excluded from food and feed chains (i.e. destroyed) at the end of their lives.
- When any decision is taken to cull animals, whether offspring or birth cohort animals, in excess of what is recommended by OIE, the reasons behind the decisions should be made clear in all public statements.

### **Tracing of products derived from the index case and cattle slaughtered on the same day and on the same premises as the index case.**

- The majority of BSE-related risk material from the index case (e.g. brain, spinal cord and other tissues normally categorised as Specified Risk Materials or SRM) was rendered rather than entering the human food chain. This, in conjunction with the fact that beef meat is considered safe, calls into question the justification for the recall of beef sold for human consumption. Nevertheless, the response was in accordance with a WHO recommendation that tissues from cattle known to be affected with BSE should not enter the human food chain.

### **Tracing of by-products arising from the processing of offal/waste derived from the index case.**

- The tracing of the rendered meat and bone meal (MBM) that may have been contaminated with specified risk materials from the index case was effective and appropriate. Extra precautions must be taken to assure that this contaminated material is destroyed and does not enter commerce or trade.

### **Termination of epidemiological investigations**

- The investigations continue to be highly resource intensive. The subcommittee firmly believes that there will be diminishing returns if these investigations continue for much longer. Although attempts should be made to identify the “birth cohort”, with approximately 50% identified so far, it may not be possible to confirm the death or location of each and every animal. This is a problem faced by all countries which do not have an effective animal traceability system.
- The subcommittee believes that the number of cattle actually infected on the farm of origin in Canada was probably small. Indeed the index case identified in the USA may be the only infected animal from the Canadian herd of origin that survived to adulthood. However, it is probable that other infected animals have been imported from Canada and possibly also from Europe. These animals have not been detected and therefore infective material has likely been rendered, fed to cattle, and amplified within the cattle population, so that cattle in the USA have also been indigenously infected. Therefore, animals that have not been identified from the birth cohort of the index case do not represent significant additional risk for further propagation of BSE within the USA. Risk materials from these unidentified infected animals must be considered when developing policies for the prevention of human infection and infection of cattle through feed.
- Under the circumstances, the subcommittee believes that the epidemiological investigation should cease, and resources be redirected into the planning, implementation and enforcement of an extended, targeted, surveillance programme and other measures to protect human and animal health.

## Response actions

Having examined the information provided on trade in live cattle and livestock feed ingredients within the North American Free Trade Agreement (NAFTA), the subcommittee firmly believes that the first case of BSE in the United States can not be considered in isolation from the whole cattle production system in North America. The significance of this BSE case cannot be dismissed by considering it "an imported case". The first BSE case detected in the USA, and the first "indigenous case" reported in Canada in 2003, must be recognised as both being BSE cases indigenous to North America. For this reason, close collaboration between all appropriate agencies in NAFTA is essential for the proper management of North America's BSE problem.

Policy actions being considered by the USA must achieve the following objectives:

- reduce public health risk for consumer protection
- limit recycling and amplification of the agent
- establish the level of effectiveness of measures through surveillance
- prevent any inadvertent introduction of BSE from abroad in the future
- contribute to the prevention of the spread of the epidemic worldwide

To achieve the above objectives, a system of complementary barriers, and implementation and enforcement of all measures on the national level, is necessary.

The objectives cannot be successfully achieved by government alone; effective implementation of measures requires a shared commitment and action on the part of national and state governments, producers, consumers, private industry, and veterinary professionals. Extensive national coordination and cooperation is imperative, and should be extended to include the continent of North America. We suggest that a BSE task force, which includes governmental and non governmental stakeholders, is established under the leadership of the USDA in order to assure that policies are developed and implemented in a consistent, scientifically valid manner.

### **Specified Risk Materials (SRM)**

- SRM are those tissues that are considered to represent the greatest BSE exposure risk to humans and animals because they contain infectivity at some point during the disease incubation period. Infectivity has been consistently shown to be present in the central nervous tissue, of naturally and experimentally infected cattle. In experimentally infected cattle, ganglia associated with the CNS (trigeminal and dorsal root ganglia) have also been assayed and shown to be infectious. Distal ileum was also infectious at several time points during the incubation phase. Experimental results for tonsil and bone marrow remain to be fully interpreted.
- Removal of all tissues with demonstrated potential for accumulation of BSE agent and strict attention to preventing cross-contamination of the carcass through stunning, slaughter and processing practices are the internationally recognized standards for protection of public health and animal health.

- The proposed US ban on SRM removes the highest risk tissues (i.e. SRM from cattle over 30 months) from the human food supply and is in accordance with OIE standards when the number of cases which have been reported so far are considered. However, given the epidemiological evidence indicating that BSE agent was already circulating in ruminant feed prior to the feed ban in 1997, and the integration of the North American cattle and feed industries, strong consideration should be given to excluding all SRM from both the human food and animal feed supplies. This recommendation also follows the current trend in international recommendations to stop amplification and limit exposure.
- Unless aggressive surveillance proves the BSE risk in the USA to be minimal according to OIE standards, the subcommittee recommends that the SRM identified below be excluded from both the human food and animal feed chains.
  - Brain and spinal cord of all cattle over 12 months of age
  - Skull and vertebral column of cattle over 12 months of age – these are not inherently infected, but cannot be separated from dorsal root/trigeminal ganglia or from residual contamination with CNS tissue
  - Intestine – from pylorus to anus – from all cattle.
- In the mean time, until the level of BSE risk has been established, the subcommittee concedes that exclusion of CNS, skull, and vertebral column from cattle over 30 months, and intestines from cattle of all ages, for use in human food is a reasonable temporary compromise.
- The current guidelines for the definition of some of these cut-off points are derived from scientific evidence from ovine and experimental murine scrapie. The detection of infectivity in the CNS of infected animals at approximately mid-incubation was extrapolated to 30 months for cattle, as this is half way through the mean incubation period of 60 months for BSE-affected cattle in the UK. In other words, CNS was assumed to be infectious in infected cattle aged 30 months or older. Nevertheless, a cut-off of 12 months represents a recognition of the fact that some cattle under 30 months of age may be slaughtered with infectivity present in the tissues described above.
- Limited scientific data suggest that, in experimental and naturally infected cattle, infectivity enters the CNS at a later time point in the incubation period than the mid-point. This is an issue that must still be addressed experimentally to evaluate not only the appropriate age for definition of SRM, but also the time at which the various diagnostic tests are effective in detecting such animals. It is very much hoped that the US government will contribute resources to support international investigations into these questions.

- While the removal of SRM will significantly reduce risk, it must be recognised that contamination of the carcass with SRM (specifically CNS) also should be avoided. The subcommittee recommends that slaughter and carcass dressing procedures, including currently used stunning procedures and mechanical deboning processes which increase the risk of contaminating meat and meat products with CNS tissue (including associated ganglia) be brought into line with international standards. Specifically, processing of skulls and vertebral columns of cattle over 30 months by mechanically recovered meat (MRM) and advanced meat recovery (AMR) systems should be banned. The complete separation of these tissues may be very difficult to implement, therefore the banning of all mechanical tissue processing methods should be considered.

### **Non-ambulatory (downer) cows**

- The subcommittee considered both the merits and the unintended consequences of the ban prohibiting non-ambulatory cattle (downers) from entering the food supply. It is true that non-ambulatory cattle are more likely to be BSE infected than are healthy slaughter cattle and therefore may pose a greater risk to public and animal health. The goals for measures related to these cattle must be to (1) test them for surveillance purposes and (2) prevent potentially infective tissues from entering the food and feed chains. Given their exclusion from supervised slaughter at inspected slaughterhouses, this important subpopulation may no longer be available for the BSE surveillance programme at these locations. Therefore it is imperative that the USDA take additional steps to assure that facilitated pathways exist for dead and non-ambulatory cattle to allow for collection of samples and proper disposal of carcasses. This most likely would involve expending resources to assist with costs associated with sampling, transport and disposal..
- In order to decrease the risk of these potentially infected cattle entering the normal slaughter process, supplemental measures to encourage compliance must be in place. These may range from financial incentives to a strengthening of ante-mortem inspections to identify questionable animals. To further prevent these cattle from being brought into the normal slaughter process, consideration may have to be given to the random sampling of appropriate subpopulations of aged cattle that have passed ante-mortem inspection on presentation at slaughter plant.
- Veterinary authorities must consider all possibilities, including education of the farmers of their role as producers of safe food, in order to achieve maximal surveillance of this risk population.

### **Surveillance**

- The goals of surveillance are to estimate the prevalence of BSE in the cattle population and monitor the success of the prevention and control measures. Now that it has been established that the BSE agent is circulating in North America, the surveillance programme in the USA must be significantly extended in order to measure the magnitude of the problem.

- The subcommittee recommends that future surveillance programmes should be targeted to the population with highest risk of exposure to the BSE agent. At some point in the past, targeting based on the location of cattle imported from Europe and other BSE risk countries, their points of slaughter and rendering and subsequent consumption in cattle feed was theoretically possible. However, with the passage of time since the importations and the amplification of the agent within North America, this approach is no longer appropriate.
- The populations with the highest risk for BSE have been shown to be those exhibiting signs compatible with BSE (passive surveillance), fallen stock (cattle that die on the farm or during transport), and cattle for emergency slaughter older than 30 months, which includes all categories of downer cows. Surveillance systems targeting these subpopulations have been shown to be the most efficient at identifying BSE cases.
- The subcommittee recommends testing of all cattle older than 30 months in the above risk populations and strengthening of the passive surveillance system. This will not only establish the prevalence of BSE but also build confidence both domestically and for trading partners. This could be achieved by means of a one-year programme, the outcome of which would then assist in designing future ongoing testing programmes.
- The subcommittee recommends that estimation of the age of cattle (to determine whether or not they are over 30 months of age) can most satisfactorily and cost-effectively be done by examination of dentition. Examination of dentition is a well-established and widely accepted means of aging cattle and is completely adequate for the purpose of determining those cattle to be tested in the BSE surveillance programme.
- The subcommittee considers testing of all cattle slaughtered for human consumption to be unjustified in terms of protecting human and animal health. However, to support the overall surveillance system and encourage reporting at the farm level testing of a random sample of healthy slaughter cattle over 30 months should be strongly considered.

### **Laboratory diagnosis**

- The comparison of findings from surveillance programmes conducted by different countries will be facilitated if similar or equivalent tools, including diagnostic tests, are adopted. The subcommittee recommends the adoption of rapid immunodiagnostic assays as the primary screening tests for active surveillance. Those tests currently approved for use in Europe have already been shown to be fully effective if used in accordance with manufacturers instructions.

- Decentralisation of testing facilities to appropriately trained staff in laboratories that can guarantee testing with a minimum of delay will be required for the surveillance programme recommended. The delay between receipt of samples and testing will need to be shorter if derived from animals slaughtered for human consumption than if derived from risk animals. Nevertheless, speed of confirmation maximises the ability to trace birth cohort and other risk animals, as well as any by-products that may need to be recalled. It is therefore recommended that a number of laboratories throughout the country be governmentally approved to conduct screening tests as part of the national surveillance program. The BSE reference laboratory should remain within the National Veterinary Services Laboratory, and should be responsible for confirmatory and proficiency testing.
- The subcommittee strongly urges the US to collaborate with the global community in the evaluation and validation of new BSE diagnostic tests

### **Feed restrictions**

- All SRM must be excluded from all animal feed, including pet food.
- Considering the BSE situation in North America, the subcommittee believes the partial (ruminant to ruminant) feed ban that is currently in place is insufficient to prevent exposure of cattle to the BSE agent. The current ban reflects the situation in Europe early in the outbreak where, with the benefit of hindsight, it can be concluded that propagation of BSE infectivity continued, albeit to a lesser extent than would have occurred in the absence of any controls. Epidemiological investigations in the UK in particular highlighted the dangers to cattle of infection through the consumption of feed that had been contaminated accidentally when manufactured in premises that legitimately used mammalian meat and bone meal in feed for monogastric species (pigs and poultry).
- Data from ongoing studies at the UK Veterinary Laboratories Agency show that cattle could be orally infected with as little as 10mg of infectious brain tissue. The prevention of cross-contamination at this level is virtually impossible to deliver where mammalian MBM intended for inclusion in pig/poultry feed or pet food is present in feed plants that produce ruminant feed. Although the subcommittee endorses the need for rigorous audit of compliance with feed controls, it should be appreciated that testing of feed and feed ingredients is unlikely to detect contamination of this low level because of the limitations of sampling techniques and test sensitivity.
- While science would support the feed bans limited to the prohibition of ruminant derived MBM in ruminant feed, practical difficulties of enforcement demand more pragmatic and effective solutions. The prohibition of the use of all MBM (including avian) in ruminant feed is justified partly due to the issues of cross-contamination as well as the current problems in differentiating mammalian and avian MBM. It also prevents the inclusion of ruminant derived protein contained within the lumen of porcine or avian intestines at slaughter in animal feed that may be used for ruminants.



- Fishmeal can still safely be used in ruminant feed provided that the possibility for cross-contamination and deliberate adulteration are excluded through compliance audits with testing.
- Cross-contamination must be prevented throughout the feed chain, from reception and transportation of feed ingredients, during the manufacturing process, through transportation and storage of finished feed, and on farm where mixing, blending and feeding will occur.
- Recognising the absence of an established infrastructure for the separation and disposal of SRM or MBM the subcommittee accepted that a staged approach may be necessary for implementation.
- Exclusion and destruction of such a high volume of raw material is a massive burden on all countries currently affected by BSE. Given the susceptibility of cattle to low dose exposure, and the fact that no processing system exists at present to guarantee destruction of infectivity in commercial processes, it is probable that restoration of traditional uses in feed may be impossible. More radical and innovative solutions are required to enable the safe use of such materials in future. This should include adding value through their use for purposes other than the manufacture of feed and fertilisers (e.g. as a fuel source).
- The subcommittee recommends that the current feed ban be extended to exclude all mammalian and poultry protein from all ruminant feeds, and that this ban as well as measures to prevent cross contamination be strongly enforced. This recommendation must be enforced through an inspection program including sampling and testing of feed. If at some point it becomes possible through other means (e.g. inspection, testing, and enforcement) to achieve the equivalent result of assuring that no ruminant proteins are ingested by ruminants, then exclusion of all mammalian protein from feed for ruminants may not be required.

### **Traceability**

- The subcommittee acknowledges that the authorities have recognised the importance of effective identification and traceability systems, that have value not only for the cost-effective and rapid tracing of animals for culling, but also for containment of contagious diseases. It encourages the implementation of a national identification system that is appropriate to North American farming.

### **Education**

- It is not possible to achieve compliance with legislative controls without an effective educational programme. This is particularly important in an environment when mixed messages potentially confuse those that are required to enforce legislation, and may undermine compliance. In other words, statements that “beef is safe” should not undermine efforts to eliminate or reduce risk, because in reality “beef is safe **because** of the risk reduction measures.”

- Furthermore the justifications for government action must be made clear, whether for practical, economic or risk reduction purposes in order to avoid unnecessary public anxiety and avoid reinforcing misconceptions about the disease.
- The dissemination of information on the variety of clinical signs of BSE is crucial, especially considering the subtle nature of many of the signs that are not normally portrayed in TV coverage. This will ensure that the effectiveness of the surveillance programme is improved by ensuring the capture of **all** appropriate risk animals for testing.
- BSE educational programs must be designed to meet the needs of multiple audiences with variable levels of scientific training. Countries around the world have routinely underestimated the need for a wide variety of educational materials and training techniques to meet both technical and non-technical audiences. The subcommittee recommends that extensive education and training materials be developed in collaboration with academic, professional, trade and consumer organizations so that scientifically sound and accurate information about the nature of BSE and the importance of aggressive prevention and control strategies can be disseminated widely and incorporated into the curricula of schools, college, universities and professional continuing education programs. As traceability, transparency and access to current information increases, so does consumer confidence and effectiveness of the control and prevention measures.

**Control of the implementation of measures taken:**

- The experience in Europe shows that control measures prescribed by law are not always implemented as intended. Regional officials are often responsible for implementation, however the quality and effectiveness of the controls may vary greatly between regions. Therefore, quality assurance systems need to be implemented at all levels under the overall supervision of national authorities.

**Lessons learned**

- The subcommittee appreciates the intent of the US government to follow a science based approach to policy formulation.
- The North American cases demonstrate again that exporting countries feel significant national social and financial impacts when importing countries fail to comply with international rules regarding trade.
- Therefore, the subcommittee recommends that the US should demonstrate leadership in trade matters by adopting import/export policy in accordance with international standards, and thus encourage the discontinuation of irrational trade barriers when countries identify their first case of BSE.

- In addition, the subcommittee hopes that the US will continue to act responsibly when considering export of potentially contaminated materials such as live cattle, MBM and feed. Risk materials must be destroyed or safely utilized to protect human health, animal health, and the environment in the USA and worldwide.

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